X. *The Anatomy and Development of certain* Chalcididæ *and* Ichneumonidæ. *By* George Newport, *Esq., F.R.S., F.L.S. &c.*

PART III. ICHNEUMONIDÆ (continued).

Read June 5, 1849.

Ichneumon Atropos, Curtis.

Several years ago, chiefly in the year 1829, I obtained many specimens of *Ichneumon Atropos* (fig. 1. Tab. IX.), both in the larva and perfect states, in the neighbourhood of Canterbury, but I have not yet met with it in any other locality, nor since the year 1834*. Mr. Curtis, to whom we are indebted for the description, and an admirable figure of the species†, states it to have been bred by Miss Giraud at Faversham, from the larva of *Acherontia Atropos*; that the perfect insect, from which his drawing was made, was taken at Rochester by Professor Henslow; and that another specimen had been taken at Darent Wood by Mr. Davis, so that the insect appears to be a truly Kentish species. It was by no means uncommon in the neighbourhood of young ash plantations, at Canterbury, in the month of July, at the period I have referred to, when I took it on the wing; and I have several times reared it from the pupa of *Sphinx ligustri*, and very frequently have found the larva within the body of the larva of this Sphinx. It seems in fact to be a parasite common to this Sphinx; much more so perhaps than to *Acherontia Atropos*. Mr. Curtis, when describing the species, suggests that the true Ichneumons "prefer naked caterpillars, and probably puncture them after they have descended into the earth, but before they have changed into chrysalids." But this is not the habit of *Ichneumon Atropos*, as I have often found the Ichneumon-larva (fig. 2 *a*, *b*, *c*) within the body of the Sphinx caterpillar several days before this had acquired its full growth, or had ceased to feed, and consequently long before it would have entered the earth to change to a pupa. I suspect that the egg of the Ichneumon is deposited quickly after the caterpillar has changed its skin, and has entered its last period of growth; since, at about the middle of that period, I have found the parasite within it more than a quarter of an inch in length; and consequently, it must then be at least two or three days old. This length of time, added to a similar period, which we may suppose to be necessary for the hatching of the egg after deposition, will bring us to the commencement of the last stage of the caterpillar, when its tegument is soft and pierced with least difficulty. I am not aware whether the Ichneumon-egg is deposited on the surface of the skin through which the larva eats its way into the body, when hatched, like the larva of *Stylops*, or whether, as seems to be most probable, the egg is plunged at once into the caterpillar. The latter opinion seems to be

* Since this paper was read, I have obtained two specimens of the imago from pupæ of *Sphinx ligustri* during the past summer, 1852.

† British Entomology, vol. v. p. 234.

supported by the fact that I have never yet met with even the youngest larvæ between the skin and muscles of the caterpillar, but always internal to the muscles, imbedded in the so-called fatty tissue, between them and the alimentary canal, and always on the dorsal surface, and usually with its head in the direction of that of the caterpillar. I have found it in different stages of growth, from one-fourth to three-eighths of an inch in length (*a*), as early as the middle of August, when it is of a light pea-green colour; but I have obtained full-grown specimens (*c*, *d*) only from the pupa of the Sphinx, sometimes as early as the end of October, but more frequently not until the commencement of March, and sometimes as late as the end of April. Usually, one egg only is deposited in each caterpillar, but sometimes there are two, and both become hatched, although of the parasites one only arrives at maturity, as one is invariably destroyed by the other. I have the following entry of a fact of this kind in my note-book with the date "March 13, 1832," which shows that two larvæ may exist in the pupa of the Sphinx up to a late period, but that one is then destroyed. "The pupa now examined was one in which *Ichneumon Atropos* had deposited two eggs. Two larvæ had been hatched, and these were located in the lower part of the abdomen of the pupa. One of them was very small, being scarcely more than one-fourth of an inch in length, and appeared to have been dead for some time. The other was a fat well-fed specimen, about three-quarters of an inch in length and one-sixth in diameter. It seemed to have destroyed part of the fatty sacculi of the Sphinx, and was lying in the cavity of the body, but it had not injured the upper part of the digestive apparatus, the stomach, behind which it lay so imbedded that I had almost mistaken it at first for the intestine and colon, which had not undergone their proper change. The nervous system of the pupa had not been injured by the larvæ, although its changes had been retarded. It thus appears that the Ichneumon sometimes deposits more than one egg in the body of the caterpillar, as several times before this I have found two of these larvæ in the same insect, although, I believe, never more than one of them comes to perfection." All my subsequent observations have confirmed this conclusion.

The usual situation of the parasite in the Sphinx-pupa is in the tissue of the middle part of the body beneath the dorsal vessel and above the stomach, on which it often rests. This is the position of the full-fed larva in the drawing and preparation (fig. 3), and this is the specimen alluded to and partly described in my second memoir on *Meloë*, printed in the Society's Transactions, vol. xx. p. 335. It was obtained at almost the latest period of the larva state, on the 18th of April, 1832. The other specimens exhibited were procured between that period and the month of October, so that the insect continues to subsist on the Sphinx, and probably passes into a state of hybernation with it, during the long interval of six months. One specimen found on the 20th of March, and removed from the body of the pupa into water, lived several days, while another, not placed in water, spun a few delicate threads to prepare for its change to a nymph. This change usually takes place in April, but when placed in water at that period it soon perishes, as its respiration has then become more active, as the following entry from my note-book shows:—"April 21, 1832. On dissecting a male pupa of *Sphinx ligustri*, a few days ago, I found, somewhat to my mortification, one of my old friends, the larva of *Ichneumon*. It was a large and full-fed specimen, and laid with its anterior portion in the thorax, and its posterior in the abdomen of the pupa. I put it by for future examination in a vessel of water, having first made a drawing of it (fig. 2 *d*). The spiracles, on each side of its body, are oval, corneous, and slightly project from the tegument, and are situated one at the anterior part of each segment, a little above the longitudinal trachea, and immediately anterior to the trachea that supplies the dorsal surface of each segment. The whole of the tracheal vessels are distinct and distended with air. On looking at it this morning I found it dead." So that although the parasite may reside for many months bathed by the fluids of the Sphinx, it perishes when a change occurs in the degree of activity of its respiratory functions. The length of time which it remains in the nymph-state is about a month or six weeks at the utmost, as most of the specimens I have bred from the pupa have appeared in June. The perfect insect makes its way out of the dead pupa of the Sphinx by perforating the case with its mandibles, on the dorsal surface, and sometimes, as in the preparation now exhibited, it becomes fixed in the orifice and unable to escape (fig. 4).

The body of the larva (fig. 2 *a* to *d*) is composed of fourteen segments, or, if the pedal process of the last segment be reckoned, of fifteen. It is elongated, somewhat tapering, and curved in its earlier stages of growth; but is thick, fat, and pointed at its anal extremity, when mature. The pedal or terminal portion of the last segment is pointed and projecting, and is opposable to a process from the inferior margin of the thirteenth segment, with which it forms a kind of forceps, or prehensile organ by which the larva may affix itself, and change its position in the body of the Sphinx The lateral margins of all the segments are thinned and project as tubercles. These are well-marked in the pro-, meso-, and metathoracic and pre-abdominal segments, but are most distinctly tubercular from the fifth to the eleventh inclusive. These latter segments have also distinct tubercles or segmental appendages on each side of the ventral surface in the shape of mammæ, and in the position of the false feet of the *Terebrantiate Hymenoptera* to which they may be regarded as analogous, and as subservient to the movements of the larva within the Sphinx. The lateral tubercles of the Ichneumon-larva have already been noticed by naturalists, but I believe this is the first time that ventral tubercles also have been discovered. In the very young larva they are situated nearer to the side of the body than in the full-grown, and become more and more approximated to the median line, as the growth of the larva proceeds, by the greater extent of growth and development of the dorsal than of the ventral portion of the segments; thus beautifully illustrating the corresponding process of growth of the segments, and the approximation of the limbs to the median line of the body, in the *Myriapoda*. But although pedal tubercles exist along the ventral surface of the abdominal segments, the future true legs of the perfect insect are indicated only by six white points on the ventral surface of the thoracic segments, in the precise situation, however, of the tubercles on the abdominal.

The head (fig. 5) and mandibles (*d*) of the larva are strong, corneous and of a yellow colour, with the margins and apices of the mandibles black, curved and sharp-pointed, fitted only for piercing and suction, and not for manducation. The maxillæ (*e*) are three-jointed, with the terminal joint broad, triangular, soft and membranous, the second joint very short, and the basal joint strong and elongated. The labium (*f*) is triangular, with a slight median ridge, and a narrow membranous border, admirably fitted with the margins of the maxillæ for suction. The strength of the mandibles, and the consolidation of the parietes of the entire head, prove to us that the force necessary to overcome the contractile power of the tissues in the Sphinx, in obtaining nourishment, is by no means inconsiderable; yet this force appears to be little, if at all, under the power of volition, since the Ichneumon-larva, like that of *Paniscus*, exhibits only the very slightest indications of sensation, when touched or pressed. It makes no distinct effort to escape, but merely contracts its body, perhaps simply by reflected action, without any intervention of consciousness. This is precisely the condition, as regards the consensual functions of its nervous system, (fig. 9.) under which we might have expected it to exist. Shut up in the body of another animal, and subjected to the compression of its tissues, the endowment of sensation would only entail on it an amount of suffering proportioned to the degree of its perception. Vegetative, or simple organic life, therefore, is, as yet, sufficient for all the requirements of its existence; although afterwards it is to become endowed, as certain of its consensual organs are developed, with perceptions and instincts the most acute. Thus we find in this larva that organs of vision, totally useless to it in its intra-abdominal abode, do not yet exist; and the place of their future development is scarcely even indicated; while the antennæ, almost equally useless to it in its present condition, exist only in the most rudimentary state, merely as slight horny elevations, on the front of the head, (fig. 5 *a*) on each side of the clypeus (*b*), formed of a series of concentric rings (fig. 6) the centre of which is the apex of the future tactile organ. Into this centre I have succeeded in tracing the termination of the antennal nerve; the optic nerves, for the future eyes, being in their usual situation at the sides of the cerebral ganglia. I have also succeeded in tracing this nerve into the corresponding part in the larva of *Anthophora*, in which the antenna is more developed than in *Ichneumon*, and forms a little cone of concentric rings. In *Monodontomerus* the same part is terminated by a single hair (fig. 7), precisely as hairs and spines originate in the central nuclei of tegumentary cells in the larva of *Meloë*.

I have elsewhere shown* that the form of the digestive apparatus is very similar, at the earliest periods of growth, in all parasitic *Hymenoptera*, whether they are enclosed in the same cell with their victim, as in *Monodontomerus*, whether carried about with it attached to its surface like *Paniscus*, or whether shut up within its body like *Ichneumon*. In each of these instances there is not merely a general similarity in the form of its parts, but there is also a concordance in their function. The intestinal portions continue small and imperfect, and no fæces are passed until the larva has arrived at its maturity. I may now further state that this principle, or law, is not confined to the strictly parasitic, or carnivorous larvæ, but operates, as I believe, among the omnivorous, and certainly among the true pollinivorous. The digestive apparatus in the larva of *Ichneumon* (fig. 8), is a pear-shaped elongated sac (*f*), with only a very short intestine (*g*, *h*, *i*), through which, I have reason to believe, no fæces are passed until the larva has ceased to take food. It differs from the great digestive organ in the Hornet chiefly in its larger diameter as compared with its length. Hence we might expect to find but little variation in its function. In

* Linnean Transactions, vol. xxi. p. 61.

Anthophora, as I ascertained many years ago, the chief portion of the digestive organ is an elongated stomach, and although in this instance a short intestine and colon exist, not an atom of fæces is passed, as I have many times, to my complete satisfaction, proved, until the whole of the food is consumed, and the larva has attained its full size.

IV. Development of the Alimentary Canal and its Appendages.

These remarks on the anatomy and development of parasitic *Hymenoptera,* compared with their economy and instincts, lead us to inquire into the mode in which the alimentary canal in Insects is formed. The first developed portions of the parietes of the body in the embryo are the ventral and lateral divisions of the segments. These are produced before the alimentary canal is commenced, the space between them being occupied by the yolk, which supplies the means of growth to the whole. The lateral portions of the segments grow from below upwards, and their free margins gradually more and more approach each other, until at last they meet along the median line of the dorsal surface of the body. The parts which first meet are those of the cephalic, and afterwards those of the anal segments, and the junction of the remaining segments then proceeds in gradual succession from behind forwards, as I have witnessed in very numerous observations in the embryo of *Forficula.* The whole of the remains of the yolk, composed entirely of masses of nucleated cells, is thus gradually enclosed within the body, by the successive union along the dorsal surface of the two sides of the segments, from behind forwards, the last portion included being in the prothorax. The fact of the yolk entering the body at this point of the thorax in the *Crustacea* was first pointed out by Rathke. From the remains of the yolk thus included the alimentary canal is entirely formed, the external portion giving origin to muscular tissue and basement membrane, and the internal, besides supplying nutriment for the further development of the embryo, becoming organized into an elaborating tissue, which for a time retains the general character of the original cell-masses of the yolk, as shown in *Monodontomerus.* The termination of the future alimentary canal is thus the result of a folding on itself of the first portion of the yolk included by the completion of the anal and penultimate segments, and is the commencement, posteriorly, of the column of cells which, becoming perforated, constitute the future colon and small intestine, and which retain the cellæform structure to so late a period in some larvæ, as in the instance we have seen in *Monodontomerus.* In this way, formed from the included yolk, the digestive apparatus becomes a hollow cavity, closed, at first, at its abdominal end by the approximation of the whole of its component structure, but communicating anteriorly with a canal which is formed between the parts of the future mouth, and which becomes its inlet or œsophagus, the connexion of the yolk with the dorsal surface of the body in the prothorax being entirely obliterated. As the growth of the body proceeds, the walls of the alimentary canal become thinner, lose much of their cellæform condition, and acquire a more organized structure. The column of cells which connect the great digestive cavity with the anal segment, as in *Monodontomerus,* are gradually transformed into muscular tissue, from without inwards, and constitute the future intestine, or colon and ilium. These parts being chiefly for the transit of the fæces, and further elaboration of the contents of the stomach, are later developed, but acquire a more muscular structure than the great digestive cavity, which longer retains its cellæform condition, its lining cells becoming changed into secreting or glandular structures, of two kinds; one of which elaborates the juices required for digestion of food, while others take up the results and diffuse them through the body for the general purposes of nutrition.

Hence we find that the general form of the great digestive cavity is very similar in all embryos of a given class, at the earliest periods; and similar in all which pursue a like habit of life, as in Hymenopterous parasites; the chief structural differences being in those parts which become small intestine and colon. Different species, even among the parasites, differ slightly in regard to these parts, both as to form and as to period of completion. In *Monodontomerus* we have found that the whole of the digestive canal long retains its cellæform condition, its muscular tissue being completed very late. In *Ichneumon* (fig. 8), and *Microgaster* (fig. 11), which feed within the body of their victims, the intestinal portion (*g*, *h*, *i*) of the digestive apparatus is completed more early, and a canal, paved with epithelium, is formed in it, but continues almost completely closed, and does not admit into it a particle of the matter to be rejected until the growth of the parasite is complete. In *Microgaster* the small intestine (*g*) and colon (*h*) are ready to convey the fæces more early than in *Ichneumon*; and this seems to have some reference to the special requirements of this species for a more early rejection of the waste of nutrition. In like manner the more or less early completion of the *appendages* of the digestive apparatus in the advanced growth of the embryo, or of the larva, immediately precedes the unfolding of some speciality of function or of instinct. I have already shown, in the first part of this paper, that the earliest completed glandular organs connected with the digestive apparatus in the larva of *Monodontomerus*, are the *salivary*. So we find also in *Microgaster* (fig. 11), in which they are not only early, but most extensively developed (*d*), for the production of that abundance of silk which is formed by this larva in the construction of its cocoon quickly after it has issued from the body of the insect it has devoured. In *Ichneumon Atropos* also, I have found the salivary organs (*d*) extensively developed in the larva at an early period, doubtless for a similar purpose. Dufour was unable to detect these organs in the perfect *Ichneumon*, although he correctly believes in their existence. The Malpighian structures (*k*), attached to the commencement of the intestinal portion of the digestive apparatus, and the function of which is still a question with some physiologists, although usually believed to be that of the liver, are completed, as we might fairly have anticipated, at a much later period in these parasites than in the vegetable-feeding larvæ, in which the food requires greater elaboration to assimilate it with the animal tissues, than in the carnivorous feeder, which imbibes the ready-formed animal juices of another body. In *Monodontomerus*, the Malpighian organs, even at the close of the feeding period, still exhibit evidences of their original mode of formation by the longitudinal junction and coalescence of cells to form tubes; while in *Ichneumon* and *Microgaster* these parts are more early and more extensively developed, although even in them they are incomplete. On the contrary, in the true vegetable-feeding larvæ, the herbivorous caterpillars, these organs exist well-formed almost from the period at which the insect leaves the egg and begins to feed; and, in many instances, have their secretory capacity increased by the development of cæca over their whole surface, from their opening into the alimentary canal to their distal terminations, which, in all insects, are cæcal, and do not, in any way, anastomose with any other structure; as some have erroneously supposed them to do with the so-called *adipose*, or splanchnic tissue.

Thus we find that in proportion to the more or less early development of any structure or organ, the function or instinct associated with that organ is more or less early evolved; and that in proportion to the completeness of a tissue, such is the degree or perfection of each special function or instinct in the animal.

Additional Note.

Read February 15, 1853.

The change of form and condition which the alimentary canal undergoes, after the parasite has ceased to feed (fig. 8) and is assuming its imago state (fig. 10), is as remarkable as that which takes place in the vegetable-feeding caterpillar, in changing to the chrysalis of the future butterfly or moth. The short narrow œsophagus (*e*) becomes considerably elongated, and instead of terminating, as in the larva, in the third or meso-thoracic segment, it is extended, in the imago, through the meta-thoracic, into the abdominal region. In the anterior portion of the abdomen, the fifth, sixth and seventh segments, it is then dilated into a conical-shaped crop (*f*), which, by a constriction at its termination, and a reflexion inwards of its tissues to form the cardiac valve, is separated from the true digestive cavity, the stomach. This portion of the canal, the chylific ventricle (*f*,*f*), which occupied nearly the whole interior of the body of the larva, is now restricted to the eighth, ninth and tenth segments. It is a powerful muscular structure, of a somewhat elongated oval shape, and the length of which is scarcely more than thrice its diameter. Around its termination are inserted, externally, the hepatic or Malpighian organs, from twenty to thirty in number (*k*), where, internally, by a reflexion of the tissues, is formed a second valve, the pylorus. The canal then becomes narrowed into what may be regarded as duodenum and ilium, or small intestine (*g*). Beyond this it is again dilated into a more muscular structure (*h*, *i*), the colon or rectum, which is usually filled with *ejecta*, and terminates at the anal valve.

The canal in the imago, as in the larva, is formed of distinct layers or tissues, a *muscular*, a *glandular*, and a *mucous*; and is invested, externally, by a distinct, transparent, *peritoneal membrane*, which appears to be homologous with the peritoneal covering of the viscera in the Vertebrata, and processes, or reflexions of which, in these Invertebrata, clothe every internal organ, the salivary and hepatic glands, the organs of circulation and reproduction, and the adipose tissue, and tracheæ; as expressly mentioned, in regard to the latter, in my article 'INSECTA*.'

The tissues of the alimentary canal are, however, much changed in condition in the imago, from that in which they exist in the larva,—a change which is accompanied by some alteration of function in the entire organ. In the *larva*, in which the canal is little more than a capacious bag, the external or *muscular tissue* is imperfect, and consists of

* Cyclopædia of Anatomy and Physiology, vol. ii. part 18, p. 965 (Oct. 1839).

only a very few longitudinal and transverse fibres, which are separated by wide interspaces (fig. 12 *a*); the one extending throughout the whole length of the organ, and the other encircling every part of it; and these are crossed obliquely by a few fibres which attach the canals loosely to the tegument, and aid its peristaltic movements. But the *glandular* or middle tissue is more complete. It is composed of the cells before alluded to*, which are large, hexagonal in shape, and, in most instances, correspond to the interspaces formed by the decussation of the muscular fibres (*b*). Each cell in its interior has a very large granular nucleus. The *mucous*, or lining tissue of the canal, is formed by a layer of somewhat flattened cells, which have small granulated nuclei, are loosely aggregated together, and have all the characters of epithelial cells (*c*). In the *imago*, however, the *muscular* tissue is composed of very strong longitudinal and transverse bands, crossed as in the larva by a few delicate oblique ones; while the *glandular* tissue is less marked, the *mucous tissue* being most developed; thus, preceding in its changed condition, the change of food of the perfect insect.

Every part of the canal is supplied with tracheæ, the trunks of which, one in each segment, passing transversely inwards, divide into branches, which, again subdivided, penetrate into and ramify through the structure. These, like all other tracheæ, are formed, as described by Sprengel, of three tissues, an external *membranous*, and an internal *mucous*, which enclose between them a strong spiral fibre. The external, as I formerly showed†, so loosely invests the middle, or spiral, that, usually, there is some interspace between them; and, as also mentioned‡, this external tissue is simply a reflexion and extension of the common peritoneal membrane. The ramifications of tracheæ which penetrate the structure of the canal, or of any other organ, become, as I have since found, denuded of this covering as they enter, and then seem to be formed only of two tissues, the spiral and mucous,—if, indeed, there be not also, as I have reason to think there is, an extremely delicate serous, or basement membrane, closely adherent to, and uniting the coils of fibrous tissue, on its external surface. The tracheæ which penetrate the muscular layer of the canal terminate in the glandular or adipose layer, where a few of the branches anastomose; but, as elsewhere stated§, "they do not ramify in the internal or mucous membrane." The *ultimate divisions* of these tracheæ are always distributed separately, and *do not anastomose*. They end in extremely minute, filiform, blind extremities, as noticed by my friend Mr. Bowerbank, F.R.S. This I find is their condition in all structures, in the nervous and tegumentary equally as in the glandular and muscular.

These facts may, perhaps, assist us to understand the nature of the injection of the tracheæ by M. Blanchard‖, and also the mode of nutrition in insects;—the ultimate branches of tracheæ in the tissues of the alimentary canal operating, possibly, as absorbent structures, and inducing the chylific fluid elaborated around them to flow, in its transit outwards, along the channels formed by their loose peritoneal covering, into the regular circulatory currents¶,—a view which, in part,—so far as refers to the presumed absorbent operation of the tracheæ,—was long ago held by Dr. Kidd, in his paper on the Anatomy

* P. 89.

† On the Respiration of Insects, Phil. Trans. 1836, p. 530. pl. 36. fig. 1.

‡ Article 'Insecta,' *loc. cit.* p. 965.

§ *Loc. cit.* Phil. Trans. 1836, p. 532 and 564, pl. 36, fig. 4.

‖ Annales des Sciences Nat. 3me Série, tom. xi. p. 372, *et seq.*

¶ Article 'Insecta,' p. 979.

of the Mole Cricket*; although the precise structure and mode of termination of the tracheæ now described appear to have been unknown to him. Further, they may assist to explain the mode of coloration of the tracheæ in the experiments of MM. Alessandrini and Bassi†, and M. Blanchard‡, and also in others, yet unpublished, by myself, made on the larvæ of *Clissocampa Neustria*, in July 1837.

EXPLANATION OF THE PLATE.

Tab. IX.

Fig. 1. *Ichneumon Atropos*, imago state.
Fig. 2. *a*, *b*, *c*, *d*, larvæ of Ichneumon in various stages of growth.
Fig. 3. Full-grown larva (*a*) between the adipose tissue (*b*) and stomach (*c*) of a pupa of *Sphinx ligustri*. (*d*) brain; (*e*) muscles of the thorax; (*f*) heart; (*g*) testes.
Fig. 4. Perfect Ichneumon escaping through the back of a destroyed pupa.
Fig. 5. Upper and under surface of the head of the larva. (*a*) antenna; (*b*) face or clypeus; (*c*) labrum; (*d*) mandible; (*e*) maxilla; (*f*) labium.
Fig. 6. Magnified view of antenna of larva of Ichneumon.
Fig. 7. Antenna of larva of *Monodontomerus*.
Fig. 8. Alimentary canal, &c. of larva Ichneumon. (*a*) antenna; (*b*) brain; (*c*) optic nerves; (*d*) salivary glands; (*e*) œsophagus; (*f*) stomach; (*g*) intestine; (*h*, *i*) colon and rectum; (*k*) Malpighian organs.
Fig. 9. Nervous system of the larva.
Fig. 10. The imago *Ichneumon* dissected; letters as before.
Fig. 11. Alimentary canal and appendages of *Microgaster*.
Fig. 12. Tissues of the alimentary canal in the larva Ichneumon. (*a*) muscular layer or tissue; (*b*) glandular; (*c*) mucous.
Fig. 13. Respiratory system in the abdomen of perfect Ichneumon.

* Phil. Trans. 1826, p. 235.

† Gazette Médicale de Milan, t. vi. and Annales des Sciences Nat. 3me Série, tom. xv.

‡ *Loc. cit.* tom. xv.